

compromise between the two. From all these circumstances I conclude it to be a hybrid between the Turbot (*Rhombus maximus*) and Brill (*R. lævis*), and as such I submit it to your judgment.

“This specimen is a male, and had the milt well developed; the one Mr. Buckland has is a female, and the ova were in a similar condition.”

The following papers were read:—

1. On the Anatomy of the Proteles, *Proteles cristatus* (Sparrman). By WILLIAM HENRY FLOWER, F.R.S., F.Z.S., Hunterian Professor of Comparative Anatomy, and Conservator of the Museum, Royal College of Surgeons of England.

(Plate XXXVI.)

The first published indication of the existence of this very remarkable animal is contained in Sparrman's travels; but as his account of it has been overlooked by most subsequent writers, I will quote it in full:—

“An animal of the height of eighteen inches was known to the farmers here [Agter Bruntjes Hoogte, up the Klein Visch River] by the name of the *grey jackal*, as it approaches pretty near the common jackal in size, as well as in the shape of its head and body; but, to judge from the teeth alone, as far as I can recollect them at present, the grey jackal seems rather to bear the characteristic marks by which the *viverra*, or weasel kind, is distinguished in the ‘System of Nature,’ edit. xii.

“The hair with which the grey jackal was covered was a mixture of light grey and black; so that this creature was of a darkish ash-colour all over, excepting towards the tip of the tail, which for the length of three inches was quite black; it was besides pretty bushy, and reached down to the animal's heels. The hairs, indeed, over the whole body were pretty long and soft, but on the back they were about twice as long as in the other parts, so that they appeared to form a brush or comb; for which reason this animal may for the present be called the *viverra cristata*. I say for the present, as well on account that the stuffed skin of this creature was stolen out of my waggon by some hounds with which we had been out a hunting, before I had time to draw up a more accurate description of it, as likewise because it is very difficult as yet to define the genera belonging to the order of *feræ*. I made a drawing of the grey jackal's liver, and on going to examine it with this view, I found it divided in a singular manner. The right lung had four lobes, and the left three. The stomach had nothing but ants in it, or, to speak more properly, the white *termites* before mentioned; yet, that it may not be supposed from this circumstance that the animal here spoken of belongs to the genus of the *Myrmecophaga* of Linnæus, it may be proper to mention here that the character of this genus is



J. G. Keulemans del.

PROTELES CRISTATUS

M & N Harbutt. imp

the total want of teeth, and that, exclusively of our Swedish bears, the Hottentots themselves are likewise very fond of this food" *.

Subsequently M. Delalande brought three specimens from South Africa to the Paris Museum. These, after receiving some preliminary notices from both G. and F. Cuvier and Desmarest, formed the subject of a detailed descriptive and illustrated memoir by M. Isidore Geoffroy St.-Hilaire †, in which the animal is distinctly characterized, and named *Proteles lalandii*, the author having apparently been unacquainted with Sparman's previous notice ‡.

Although Isidore Geoffroy recognized the position of the animal as belonging to a genus distinct from, but allied to, *Hyæna*, and although Cuvier had previously called it provisionally a "*Genette hyénoïde*" §, De Blainville, in describing and figuring its skeleton in his great work on Osteology, places it among the *Canidæ*, treating it as if it only formed a subsection of the genus *Canis*, and endeavours to justify this position by its osteological characters.

In my remarks on the value of the cranial characters in the classification of the Carnivora, laid before the Society last January, I endeavoured to show that, as far as the cranial characters alone can indicate, its true position is intermediate between two groups, which I regard as nearly related, viz. the *Hyænidæ* and the *Fiverridæ*, and that it is rather with the Herpestine section of the latter family that its relationship lies.

Proteles has hitherto been known only by the skin, skeleton, and dentition, no anatomist having had an opportunity of examining any other portion of its organization.

The arrival in the Society's Gardens early in the present year of three fine specimens, shipped from Port Elizabeth, and the subsequent death of one of them (on June 13th), has enabled me to supply some of the information that has been until now so great a desideratum.

EXTERNAL CHARACTERS.

The animal was a male and fully adult (see Plate XXXVII.). Its length, from the tip of the nose to the end of the hair on the tail, was 3' 4", from the tip of the nose to the root of the tail 2' 3", the length of the tail, without the hair, 10"; the length of the head 6''·2; the greatest width of the head at the zygomata 3''·6; from the shoulder-joint to the elbow 6'', from the elbow to the wrist 6½'', from the wrist to the tip of the middle claw 5½'', from the hip-joint

* A Voyage to the Cape of Good Hope &c., from the Year 1772 to 1776, by Andrew Sparman, M.D. Translated from the Swedish original. London, 1786. Vol. ii. p. 177.

† Mémoires du Muséum d'Histoire Naturelle, tome xi. 1824, p. 354.

‡ M. St.-Hilaire gives the following explanation of the signification of the generic name which he gave to this animal:—"De προ, devant, et de τεληεις, parfait, complet. Je prends ici ce dernier mot comme équivalent de *pentadactyle*." "Le non rappellera que les pieds antérieurs du nouvel animal sont complets, quant au nombre des doigts, par opposition avec ceux de la hyène qui ne sont que tétradactyles" (*loc. cit.* p. 355).

§ Ossemens Fossiles, t. iv. p. 388 (1823).

to the knee $5\frac{3}{4}$ " , from the knee to the ankle $6\frac{1}{4}$ " , from the heel to the tip of the middle claw $6\frac{1}{2}$ " .

The head is very broad and depressed posteriorly. It suddenly contracts in front of the eyes into a depressed, rather broad, and obtusely pointed muzzle, rather dilated laterally in front of its posterior constriction, and obliquely truncated at the apex from below upwards. The "muffle" is covered with a naked, black, and finely tuberculated skin. The nostrils are quite lateral, in the form of a longitudinal buttonhole-like slit, $\cdot 5$ " long, with the anterior end rounded, dilated, and turning upwards. They are $\cdot 5$ " apart in front, and $\cdot 9$ " posteriorly.

On the under surface of the muffle is a longitudinal median groove, continued through the upper lip. The whole of the muzzle, or that part of the face in front of the eyes, is covered with a soft, dark brown or blackish, almost naked skin, having only very minute, delicate, light-coloured downy hairs, with a few scattered longer ($\cdot 3$ " to $\cdot 4$ ") hairs on the upper lip, and on each side seven or eight stout black vibrissæ or whiskers, the longest of which are $3\frac{1}{2}$ " . The lower lip and chin are also clothed only with soft downy hair, and a few scattered longer hairs in front. The true hairy covering of the skin commences a little in front of a line drawn through the angle of the mouth and the anterior angle of the eye, though the comparative nakedness of the muzzle extends on each side quite up to the eyes. There are a few slender black vibrissæ above the anterior corner of the eye, a single stout one an inch behind the angle of the mouth, and a group of three or four close to the middle line below, between the rami of the jaws, on a level with the angle of the mouth.

The distance from the tip of the nose to the anterior angle of the eye is $2''\cdot 7$; the length of the orifice of the lids is $\cdot 8$ " ; from the tip of the nose to the angle of the mouth $2''\cdot 6$.

The edges of the eyelids are of the same dusky colour as the muzzle. The upper lid has a row of fine black cilia $\cdot 3$ " in length. There are none on the lower lid. There is a well-developed nictitating membrane, white, with a dusky edge. The iris is dark brown ; the pupil appeared to be nearly circular ; the diameter of the cornea is $\cdot 6$ " . The axis of the eye is directed nearly forwards.

The ears are large, erect, and pointed ; their external surface is of a dusky purplish-brown colour, and but sparingly covered with hair, except at the edges, where short, light brown hair grows more abundantly, but there is nothing like a tuft or pencil at the end. The inner surface of the pinna is white, naked at the central parts, and but thinly clothed with hair at the sides and towards the tip. The anterior edge is nearly straight and flattened outwards. The hinder edge is produced near the base into a slight "lobule," with a hollow to its inner side, separated from the "concha," or main concavity of the pinna, by a well-marked ridge. There is no distinct tragus. In the deep part of the hollow of the pinna, close to its base, are two small transverse corrugated folds. The length of the pinna is $4''\cdot 2$, its greatest breadth $2''\cdot 3$.

The animal appears to be perfectly digitigrade. All the feet have strong, blunt, subcompressed, non-retractile, slightly curved claws.

The fore foot has five toes: the third and fourth nearly equal in length; the second and fifth slightly shorter and equal; the first, or pollex, very much shorter, its claw being midway between the wrist-joint and the claws of the other toes. The hind foot has only four, subequal toes: the fourth slightly the longest; the third almost equal to it; the second and the fifth also nearly equal, but the second slightly the shorter of the two. Each foot has a single palmar or plantar naked pad, and one pad to each toe.

The fur generally consists of a thick, soft, woolly, rather long and loose, wavy under-fur, interspersed with sparsely scattered straight stiff hairs, which project beyond the others. There are fewest of these on the under surface, and they increase in relative number above. In a broad band along the back, extending from the occiput to the root of the tail, these stiffer hairs are elongated into a crest or mane, which falls over to one or the other side when the animal is quiescent, but can be erected when it is irritated. This crest is longest on the neck and shoulders, where the individual hairs attain the length of 8".

On the face and cheeks the hair is short and stiff, gradually lengthening and becoming softer in passing backwards to the neck; on the throat it is soft and short; on the feet, below the wrists and hocks, the hair is comparatively short, stiff, and adpressed. The upper surface of the toes is thickly covered, the hair reaching to near the middle of the claws. The upper and under surface of the webs between the toes are nearly naked; but their edges are fringed with long stiff hairs, which project between the naked pads of the toes.

The hair is worn off from a small rounded patch in front of each wrist-joint, as if the animal were in the habit of going on its "knees"*. There is also a rounded bare patch, .3" in diameter, on the under surface of each heel; this appears normal and not worn. The rest of the hinder part of the tarso-metatarsal region is covered with hair as far as the plantar pad.

The tail is covered with long, stiff, bristly hair; that on the upper surface longest (5") and forming a kind of crest, so that the whole tail appears compressed from side to side. The crest of the back is not quite continuous with that of the tail, as the long stiff hairs are almost wanting at the root of the tail.

The general ground-colour of the woolly fur all over the animal is a pale yellowish or reddish brown. The throat is paler, almost white. The chest, abdomen, and limbs are of a brighter or redder tint. The upper parts, from the greater admixture of the long stiff hairs, have a greyish hue, these hairs being yellowish white, with more or less of the tip black. Where they are very long, as in the mane and tail, besides a considerable portion of the tip being black, there is also a broad dark band across the hair, and in the extremely long hairs of the shoulders there are two bands. The greater part of the tail and the free edge of the mane is thus quite black.

* Mr. Bartlett informs me that this is the habit both of *Proteles* and the Hyenas, especially when fighting. He attributes it, at least in the case of the Hyenas, to an instinctive dread lest their feet should be seized and crushed by the powerful jaws of their adversary.

The upper part of the head is dark grey. The dorsal surface of the fore feet is dark brown; the posterior, or palmar, surface pale yellowish brown. The anterior, or dorsal, surface of the hind feet is pale brown, mottled or irregularly banded with dark, and becoming quite dark at the toes. The hair on the posterior surface of the feet is pale, that on the edges of the webs of the toes very dark.

Besides the general colour of the woolly hair mentioned above, there are certain conspicuous black bands or stripes, arranged as follows:—An oval longitudinal spot on the side of the neck; three nearly vertical bands on the shoulder, of which the hinder one is much the longest; some irregular bands across the outer side of the forearm; three vertical bands on the flank, of which the most posterior is the shortest; a long band across the upper part of the thigh, inclining obliquely downwards and forwards, from the rump to the knee; and some irregular bands on the outside of the thigh and leg.

The general resemblance of the animal externally to a small Striped Hyæna has often been noticed, and is well exemplified in the living specimens in the Society's Gardens. It should be remarked that there is a considerable variation in the tone of the colour of the different individuals in the collection, the one which was first received being much lighter or greyer generally, and having the dark bands much less distinctly marked, than the specimen which is the subject of the present notice.

BRAIN.

The brain, generally speaking, is broad and rather depressed. Its form and proportions, and the disposition of its surface-markings, are shown in the accompanying figures (figs. 1, 2, 3, and 4, pp. 480, 481).

The olfactory lobes are large. The corpora albicantia were quite distinct from each other posteriorly, though blended in front. I observed nothing in the base of the brain or in the form of the cerebellum or medulla oblongata notably different from those parts in other Carnivora.

The most characteristic portion of the brain, the cerebral hemispheres, requires more attention. The length of each hemisphere before hardening in spirit was exactly 2"; the greatest breadth of the pair 1.8". Seen from above they form a broad oval, rounded at each end, slightly broader behind than in front. They are rather flattened above. The convolutions are simple, and clearly marked by deep sulci, with very few secondary furrows.

The Sylvian fissure (fig. 2, *S*) on the outside of the hemisphere, rather in front of the middle, is well marked, and runs upwards and backwards for a distance of a little more than half an inch, its superior extremity being slightly inclined forwards. As is usual among the Carnivora, the convolutions or gyri are arranged in a series of arches around and above this fissure.

There are three such gyri. The first, or lowest (*i i*), commences in the frontal lobe, above the supraorbital fissure (*O*), in common with the next; it ascends to the top of the Sylvian fissure, bends

backwards at a right angle, and then descends to the temporal lobe, its posterior limb being twice the breadth of the anterior, and indented by a vertical fissure parallel to the Sylvian.

The second, or middle gyrus (*mm*), surrounds the last in the whole of its extent, commencing in the frontal and ending in the hinder part of the temporal lobe. At its posterior superior angle it is partly interrupted in front by a short sulcus, which runs upwards and backwards from the posterior part of the main sulcus separating the inferior from the middle gyrus.

The third, or superior gyrus (*ss*) may be considered to commence in the supraorbital region*, whence it extends along the upper part of the hemisphere, bordered within by the great longitudinal fissure, as far as its posterior extremity. Anteriorly it is broad, and is sharply folded on itself in a sigmoid manner,—first winding round the supra-orbital sulcus (*O*), and then round the crucial sulcus (*C*), which runs almost directly outwards from the great longitudinal fissure for the distance of half an inch, very near the anterior end of the hemisphere. On the inner surface of the hemisphere (fig. 4) the superior gyrus is seen to extend completely round the border, bounded below by the calloso-marginal sulcus, and interrupted near the front by the crucial sulcus. It terminates by joining the middle external sulcus at the posterior apex of the hemisphere. It has several indentations on its surface, notably a longitudinal one near its hinder end.

On the inner surface of the hemisphere, below the calloso-marginal sulcus, is the "internal" gyrus of Leuret (fig. 4, *hh*), which surrounds the corpus callosum, and may be traced backwards and downwards, around the great opening through which the crus passes into the hemisphere to form the great prominence of the temporal lobe. As the sulcus on the concave side of the lower part of this gyrus forms the hippocampus major, it may be called the hippocampal gyrus.

There are thus four distinct gyri—an inferior, middle, and superior external, and an internal or hippocampal gyrus.

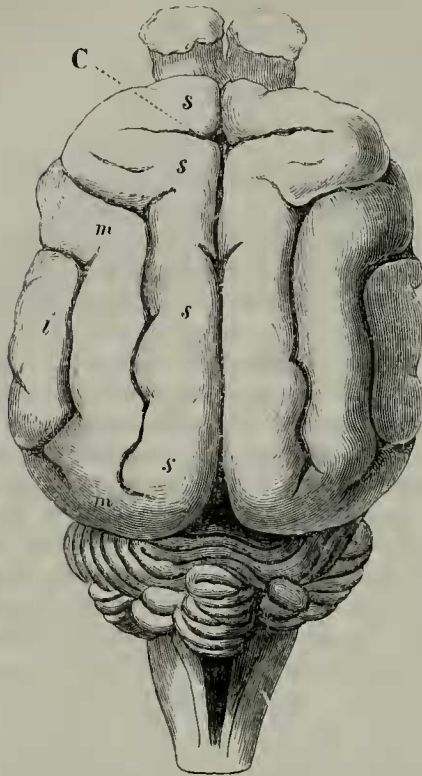
I am not aware of any published description or figure of the brain of *Hyæna*; but a specimen is preserved in the Museum of the Royal College of Surgeons, the species, unfortunately, not recorded. This brain has the gyri and sulci of the cerebral hemisphere arranged on exactly the same plan as those of *Proteles*; but being a larger brain, the secondary sulci are rather more marked. The whole brain is rounder in form, both breadth and height being greater proportionally to length than in *Proteles*, and consequently the three external gyri make higher and shorter arches.

The cerebral convolutions of the *Felidæ* are also arranged on the same pattern, but are rather more complex†. On the other hand,

* Leuret determines this portion of the brain-surface as a distinct (supra-orbital) gyrus.

† The uniform character of the cerebral convolutions in various species of *Felidæ* was pointed out by Owen ("On the Anatomy of the Cheetah," T. Z. S. vol. i. p. 133). Much valuable information and some excellent figures of the brains of the Carnivora are contained in Leuret's 'Anat. Comp. du Système Nerveux,' vol. i.

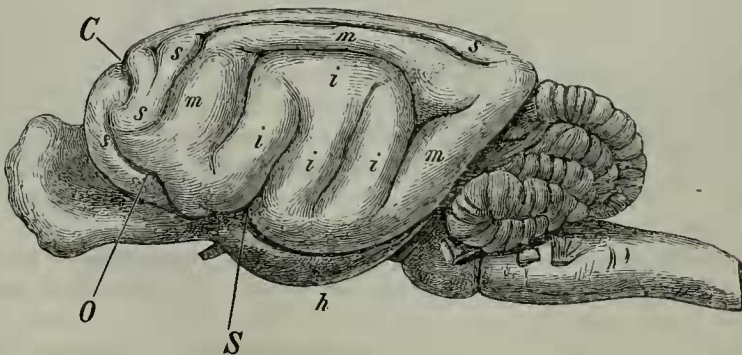
Fig. 1.



Upper surface of the brain; natural size.

C. Crucial sulcus. *i.* Inferior external gyrus. *m.* Middle external gyrus.
s. Superior external gyrus.

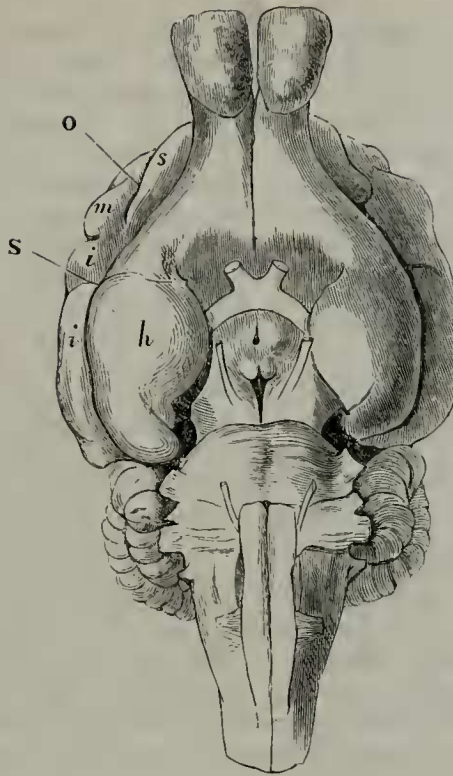
Fig. 2.



Side view of the brain; natural size.

those of the *Viverridæ* present another variation of the same pattern in the direction of simplicity. For working out all the modifications of the brain-convolutions of the Carnivora, a larger number of

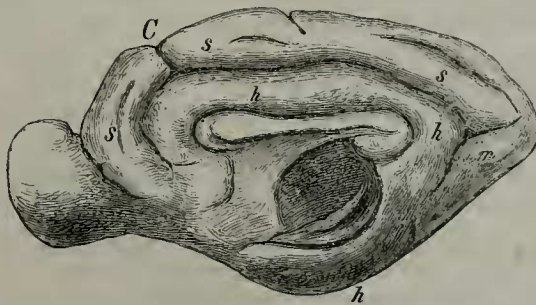
Fig. 3.



Under surface of the brain ; natural size.

S. Sylvian fissure. *O.* Supraorbital sulcus. *h.* Hippocampal gyrus.

Fig. 4.



Inner surface of cerebral hemisphere ; natural size.

specimens would be required than is at present accessible ; but the series in the Museum of the College of Surgeons is sufficiently extensive to show that they will furnish important indications of affinity, and that these indications correspond remarkably with the evidence

afforded by characters of the cranium, digestive and reproductive organs*.

The Dogs (*Cynoidea*) are very uniform in their cerebral characters, having always four distinct and regular gyri surrounding the fissure of Sylvius, which is short and approaching a vertical direction. The first and second arched gyri have the anterior and posterior limbs equal, the third has the posterior limb broad and bifurcated.

All the other Carnivora have only three arched gyri on the outer surface, the first, or lower one of the Dogs, being either wanting or concealed beneath the second, within the fissure of Sylvius†.

In the *Arctoidea* the fissure of Sylvius is rather long and slopes backwards; the inferior gyrus has the limbs long, corresponding with the length of the Sylvian fissure; the anterior rather narrower than the posterior (especially in the true Bears); the middle gyrus is moderate and equal-limbed; the upper one large, very broad in front, and distinctly marked off from the second posteriorly as far as near the lower border of the temporal lobe‡. The crucial fissure is long and oblique, and situated further back than usual.

In the *Æluroides* the Sylvian fissure is moderate and nearer to the vertical than in the last group. The gyrus which immediately surrounds it is wide, especially the posterior limb, which is generally twice the width of the anterior, and is divided by a vertical fissure, well marked in the Cats and Hyænas. In the Cats the anterior limb is also partially divided. In the Civet both limbs are simple§. The second gyrus is moderate and simple. The superior gyrus is wide in front, but small posteriorly, the sulcus which separates it from the second not extending quite to the hinder apex of the hemisphere.

MOUTH, TONGUE, ETC.

The incisor teeth, both above and below, were worn down almost level with the gums; the ends of the canines were also truncated and broken. Behind the canines there were but three teeth above and two below on each side, all, as usual, quite small and rudimentary.

The roof of the mouth is broad and nearly flat. It has four strongly marked, sharp-edged, curved ridges passing completely across from side to side, with the concavity of their curve turned backwards. The first is between the incisors and the canines; the second is opposite to the latter. The middle of the fourth ridge is one

* See "On the Value of the Characters derived from the Base of the Cranium in the Classification of the Carnivora" (P. Z. S. 1869, p. 4).

† In the *Hyæna* its hinder limb is partly exposed.

‡ Except in the smaller members of the genus *Mustela*, where the sulcus separating the superior from the middle gyrus is less produced posteriorly than in others of the group. In *Galictis vittata*, however, the brain is quite a miniature of that of a Bear; but the middle convolution is united with the upper one at its superior anterior angle. According to Leuret, a similar union is found in the Otters.

§ The *Suricata* agrees with the Hyænas rather than with the Civets in the general characters of its brain-convolutions.

inch behind the incisors. Behind these are four more ridges, which do not pass across the middle line, being interrupted for a short space; and each half ridge forms an arch by itself, having both ends directed backwards. The last two are much smaller than the others. Between the foremost ridge and the incisor teeth are three not very distinct prominences of the mucous membrane, the largest of the three being in the middle. On the depressed surfaces between the ridges, especially between the fifth and seventh, are numerous small, rounded, white tubercles. The palate behind the last ridge (which is 2''·2 from the incisor teeth) is quite smooth.

There is no distinct uvula, only a median thickening of the arched posterior margin of the soft palate. The tonsils form prominent, oblique, narrow ridges on the sides of the fauces, half an inch in length.

The tongue is large, flat, rather spatulate, and very soft or lax in its tissues. Its length is 6'', and its greatest breadth (1'' behind the apex) 1''·8. The frænum is attached nearly three inches from the apex.

The circumvallate papillæ are rather small and only two in number, placed in the usual region of the tongue and half an inch apart. The dorsal surface of the tongue behind these papillæ is soft and glandular, and bears scattered, long, soft and pointed papillæ. All the middle portion of the dorsum is thickly covered with minute conical papillæ, with their apices directed backwards and towards the middle line. Interspersed with these are numerous circular, rather flat-topped fungiform papillæ. Rather in front of the middle of the dorsum, where the tongue begins to widen somewhat, the conical papillæ increase in size, and are gradually transformed into papillæ of very peculiar form, which cover the whole of the anterior third of the organ. These are very conspicuous (being quite white and very hard), short, rounded cones, or bosses, set in a smooth, soft, pink membrane. Their average diameter is upwards of $\frac{1}{20}$ inch, and the distance between them nearly equal to the diameter. At the margin and apex of the tongue they gradually diminish in size. In the fore part of this curious patch the axes of the papillæ are vertical to the plane of the dorsum of the tongue; but posteriorly their apices point backwards and they are flatter, and, as before said, pass insensibly into the minute conical papillæ of the middle part of the tongue. I am not aware of any lingual papillæ exactly like these. In *Hyæna*, however, there is a central rounded patch of conspicuously enlarged conical papillæ near the apex of the tongue.

In the septum of the tongue, near the extremity, is a very small subcylindrical lytta, proportionally smaller than in *Hyæna*.

The submaxillary glands are of very large size, composed of very distinct large lobules, and of a bright yellow colour, having when fresh much the appearance of fat. The anterior end of each gland abuts against the angle of the jaw, or rather the masseter muscle covering it; the posterior against the transverse process of the atlas. Above it is in contact with the inferior surface of the cartilaginous meatus auditorius externus. Superficially it is covered by the platysma. In general form it is pear-shaped, having the large

end, which is flattened and has a rounded outline, turned backwards. The front end is truncated, or, rather, hollowed to receive the angle of the jaw, and has a short process projecting inwards. The gland is, moreover, bent upon itself nearer the anterior than the posterior end, at an angle which varies according to the position of the head of the animal; when the head is stretched forwards it is straightened, and then measures 2''·2 in length. The greatest vertical thickness is 1''.

The duct (Wharton's) leaves the gland on the internal surface, near the anterior extremity. It is of the thickness of a small crow-quill, and runs forwards, internal to the external pterygoid muscle, between this and the mucous membrane, and along the floor of the mouth, to just in front of the frænum of the tongue, where it terminates in an orifice situated on the inferior surface of a flattened leaf-like projection of the mucous membrane with a dentated edge. This process is ·2'' in length, of the same breadth, and its inner edge is less than ·1'' from the median line.

The sublingual gland is long and narrow, and is in contact with the outer side of Wharton's duct for nearly the whole of its length. Its duct opens on the inferior surface of the same sublingual process, to the outer side of the orifice of Wharton's duct.

The epiglottis forms about half a cylinder, with an internal diameter of half an inch, and a length of ·7''. Its free extremity is rounded and everted.

The anterior portion of the thyroid cartilage is narrow vertically (·4'' in middle line), forming a wide rounded arch above, and with no fissure (as in the Bears) on the lower margin. Posteriorly its alæ form broad, well-marked, ascending and descending cornua, of which the former is broadest and most rounded. The posterior border is nearly straight, 1''·1 in height. The cricoid cartilage in the middle line in front is only ·3'' deep; posteriorly it is very high (·95''), rising to form a pointed apex in the middle line. The inferior border is nearly straight, with slight undulations, all round. The arytenoids are broad and low, placed very laterally, so that they do not rise so high as the apex of the cricoid.

The vocal cords form on each side two broad, flat, contiguous bands, with parallel borders, ·45'' long, and ·35'' (the two) from above downwards, about equal in size, and separated only by a slight groove, without any ventricle. The upper (or false) cord is softer and more rounded; the lower flatter and firmer, and more fibrous in appearance. Above the rounded margin of the upper cord, and separating it from the lateral part of the base of the epiglottis, is a deep narrow sinus*.

It will be observed that the structure of the larynx accords more with that of the *Felidæ* than of either the *Canidæ* or *Ursidæ*, as described by Cuvier †, though not precisely agreeing with either. I

* C. Mayer says, in *Hyena striata* "only one vocal cord, the lower one, is present, and is broad and thick with folds, without ventricle" ("Ueber den Bau des Organes der Stimme," *Nova Acta Acad. Naturæ Curios.* vol. xxiii. 1851, p. 694.

† *Leçons d'Anatomie Comparée*, 2nd edit., tome viii. p. 786 (1846).

have, unfortunately, not the materials at hand for a comparison with the larynx of an Hyæna.

The thyroid bodies are unconnected with each other. Each is flattened, subtriangular, broad at the upper end, which reaches just above the lower border of the cricoid cartilage, and ending in a narrow tongue-shaped inferior prolongation. The entire length is 1"·1, the greatest breadth ·4".

The hyoid arch consists of the number of bones usual in the Carnivora. The basihyal is straight and narrow, nearly flat in front, rounded and slightly concave (from side to side) behind, expanded at the ends, ·8" long. The thyro-hyals are slightly curved, thick at their basal, and flattened and expanded at their thyroidal ends, ·8". The three bones of the superior cornu are of equal length, ·6"; the distal, or that nearest the basihyal, is the stoutest, and has a prominent flattened expansion of the inner border, the edge of which is turned backwards; and the whole bone has a considerable inward curve. The middle bone is simple, flattened, and slightly curved; the proximal (stylo-hyal) is very slender, except at the extremities, slightly curved, and twisted upon itself.

THORACIC VISCERA.

The trachæa is 5" in length, and ·55" in average width. It has thirty-six cartilaginous rings. It divides into two very short bronchi, which pass off nearly horizontally, and after a course of not more than $\frac{1}{2}$ " enter the roots of the lungs, each dividing into as many branches as there are lobes to the lungs. The right bronchus is rather shorter than the left.

The lungs are deeply divided into distinct lobes—the right into four, the left into three. The mode of division is as follows:—A horizontal fissure separates each lung into two nearly equal portions; the lower one, slightly the larger, has no further division; the upper one is separated into two by a fissure running obliquely downwards and backwards from the middle of the anterior border to join the horizontal fissure near the posterior border of the lung; this separates from the upper a middle lobe, which is the smallest of the three. These divisions and lobes are almost exactly similar on the two sides; but the anterior margin of the left middle lobe has two deep notches, altogether wanting in the right.

On the right side a distinct lobe (the "azygous lobe") is super-added, having no corresponding portion on the left. It is triangular, about the size of the middle lobe, and placed on the inner side of the lung, its root being between those of the middle and inferior lobes. It lies to the inner side of the latter, behind the heart.

This arrangement of the lung-lobes is that which obtains in the Carnivora generally. In the lungs of an Hyæna (*H. striata?*), No. 41, Stores, Mus. R. C. S., the divisions are precisely similar, except that the clefts on the anterior edge of the left middle lobe are wanting. The same is the case in the lungs of an *Herpestes*.

The heart is short and broad. The aortic arch, as usual in the

allied forms, gives off two main branches close together; the first, after a course of $\cdot 6''$, divides into the two carotids and the right subclavian; the second is the left subclavian.

ABDOMINAL VISCERA.

On opening the abdominal cavity, the liver was seen extending across the anterior part, occupying apparently as much of the left as the right side; next to it was seen a portion of the transversely lying stomach, then the great omentum (quite destitute of fat) completely concealing all the other viscera.

In the peritoneal cavity were numerous, very slender, white, hair-like, very stiff and elastic Nematode worms, $2\frac{1}{2}''$ long; some few, otherwise similar in appearance, were of a blackish colour*. There were no Entozoa within the intestinal canal.

The stomach and the upper half of the small intestine were distended with straw, a closely impacted mass of which produced an absolute obstruction to the passage, evidently the cause of the animal's death. The way the intestines were twisted and knotted, together with numerous partial invaginations, showed that violent peristaltic movements had taken place without successfully overcoming the obstruction. The mucous membrane was also severely congested at several spots. The lower half of the small intestines and the colon were contracted and almost empty.

The stomach (fig. 5) was short and rounded, consisting of a large and globular left end or fundus, into the upper part of which the rather narrow œsophagus enters, and a comparatively small pyloric prolongation, divided in the middle by a slight constriction. The walls are very thick and muscular, especially towards the pyloric end†. Before its removal from the body it measured $5''$ in length; its diameter, from the entrance of the œsophagus to the opposite point of the great curvature, was $3\frac{1}{4}''$.

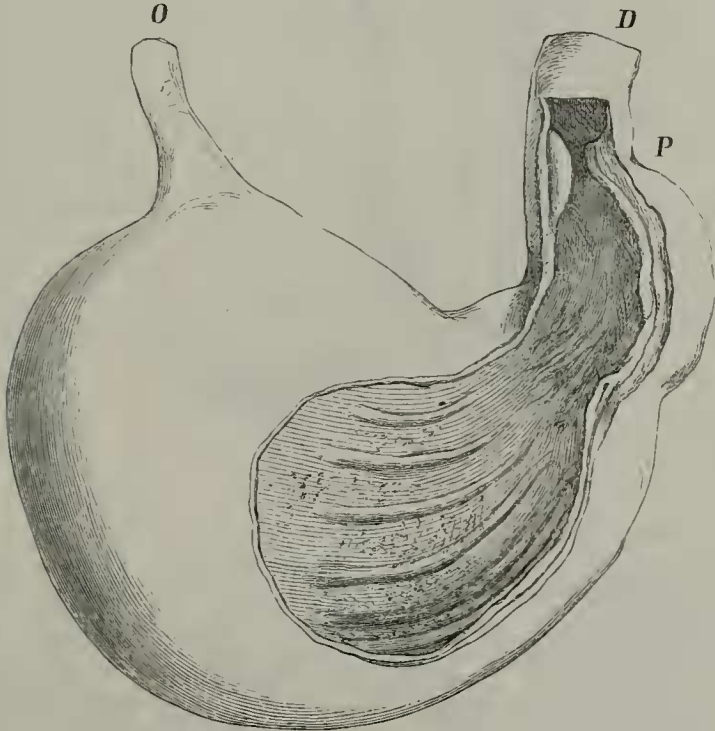
The interior of the stomach may be divided into three distinct portions:—1. The left end or cardiac portion, with a perfectly smooth pale-coloured lining membrane. 2. The middle portion, with a softer, granular-looking redder lining, and bearing a series of strongly marked longitudinal ridges or folds of the mucous membrane, most prominent and largest at the greater curvature, and extending over the lower two-thirds of the circumference, but wanting on the upper third, or that next the lesser curvature: they are nearly parallel, though more approximated to each other near the pylorus, and diverging towards the fundus, corresponding in this with the gradual enlargement of the walls of the cavity in this direction. 3. In the narrow right extremity of the stomach extending $2''$ from the pylorus, the mucous membrane is again smooth, or only slightly raised into some

* Some of these have been forwarded to Dr. Cobbold for examination. He reports that they belong to a species hitherto undescribed, and proposes to give an account of their structure at an early meeting of the Society.

† Daubenton describes the walls of the stomach in the Hyæna as thin and semitransparent.

irregular longitudinal folds, not continuous with those described above. The epithelium here is very thick and white. Immediately above the pylorus the cavity is dilated on the right or great-curvature side. The opening of the pylorus is much contracted, and crescentic, being bounded by a strong transverse ridge rather more than half encircling the tube on the right or great-curvature side, and by an oblong very prominent valvular projection on the side of the lesser curvature*, which fits into the concavity of the opposite crescentic ridge.

Fig. 5.



Stomach, after being hardened by distention with spirit, and the removal of a portion of the anterior parietes: taken from the front; the drawing should have been reversed; half the natural size.

O. Œsophagus. D. Duodenum. P. Pylorus.

The small intestine, after it was laid open, measured 9' 6'' from the pylorus to the ileo-cæcal valve. The circumference at the upper part was 2½'', diminishing to 1¾'' at the lower end. There was no trace of valvulæ conniventes. The villi were abundant, especially near the upper part. Agminated glands commenced 2'' below the pylorus: the first was circular (·3'' in diameter); the largest was oval

* Similar to that observed in the Pig, Manis, Armadillo, and Sloth Bear, but not in the Carnivora generally. It may be remarked that the stomach of *Proteles*, both in form and structure, closely resembles that of the Armadillos, which are also carrion- and insect-eaters.

(2" long), and situated close to the ilio-cæcal valve. There were altogether eight such patches.

The ileum entered the large intestine almost transversely from the left, inclining slightly backwards. The short globular cæcum (fig. 6)

Fig. 6.



Cæcum, distended with plaster of Paris; half the natural size.

lay on the right psoas muscle and the iliac vessels, its rounded extremity being turned backwards and to the left. The colon, nearly three times the diameter of the ileum, ascended for $2\frac{1}{2}$ inches, till it came into contact with the under surface of the stomach, then took a rather sudden bend, curving downwards and to the left (there being no transverse colon, properly speaking) down to the left iliac fossa, a distance of 5", then curved inwards, and finally backwards as it entered the pelvis.

The length of the whole of the large intestine when straightened was 15". Its width was tolerably uniform, though contracted somewhat just above the sigmoid flexure, and dilated again in the rectal portion. It had smooth but thick muscular walls, the longitudinal bands being remarkably distinct. The mucous membrane was smooth, with numerous scattered solitary glands, especially abundant in the cæcum, at the apex of which they form a distinct cluster.

In the extreme shortness of the cæcum, *Proteles* differs both from the *Hyæna* (at least *H. striata*) and also from *Herpestes**. The intestinal canal, from pylorus to anus, is not five times the length of the body

* Daubenton figures the cæcum of the Hyæna which he dissected; it is given in the table of measurements as 9" long. Reimann found the cæcum 6" long in the same species (Spicileg. Observ. Anat. de Hyæna: Berol. 1811).

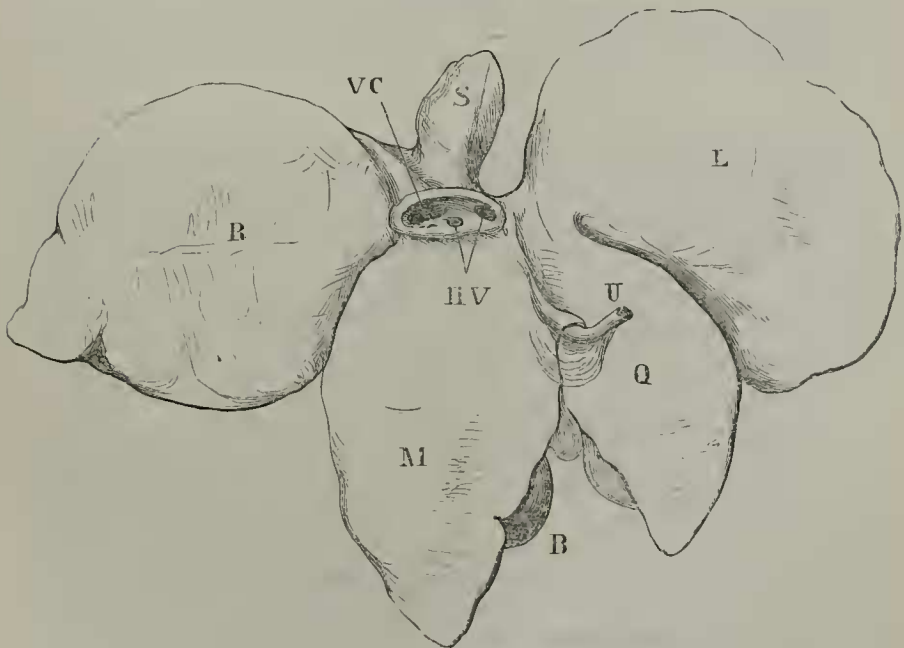
in *Proteles*; whereas in Daubenton's *Hyæna* it was more than eight times, and in one dissected by Reimann between six and seven times.

The liver (figs. 7 and 8) is large and deeply subdivided. As usual in the Carnivora, its main divisions are three, of about equal size:—
 1. The left lobe (*L*) is simple, flattened, rhomboid, without subdivisions.
 2. The middle lobe (*M* and *Q*) is broad, deeply cleft at the umbilical fissure into two pointed tongue-shaped pieces, of which the left (*Q*) is the smaller. The right portion (*M*) has the gall-bladder (*B*) attached to the left side of its under surface, its fundus projecting beyond the margin of the cleft. Between these two portions is a small accessory lobule.
 3. The right lobe (*R*) is pointed, or, rather, heart-shaped; near its upper edge are attached two accessory lobules—the Spigelian lobe (*S*), conical, pointed, and projecting backwards, and another (fig. 8, *A*), rather larger, with a truncated notched edge, turned to the right. On the under surface of the lobe, near the apex, is a triangular pointed prominence—a sort of second apex. The outer (right) border has two notches.

The entire width of the liver, when lying on a flat surface with the lobes spread out, is 8". The left lobe is 4".6 long, and 2".6 broad; the middle lobe 3".9 in greatest length, and 3".6 broad; the right 4".4 long, 3" broad.

The gall-bladder was of a simple pyriform shape, without any

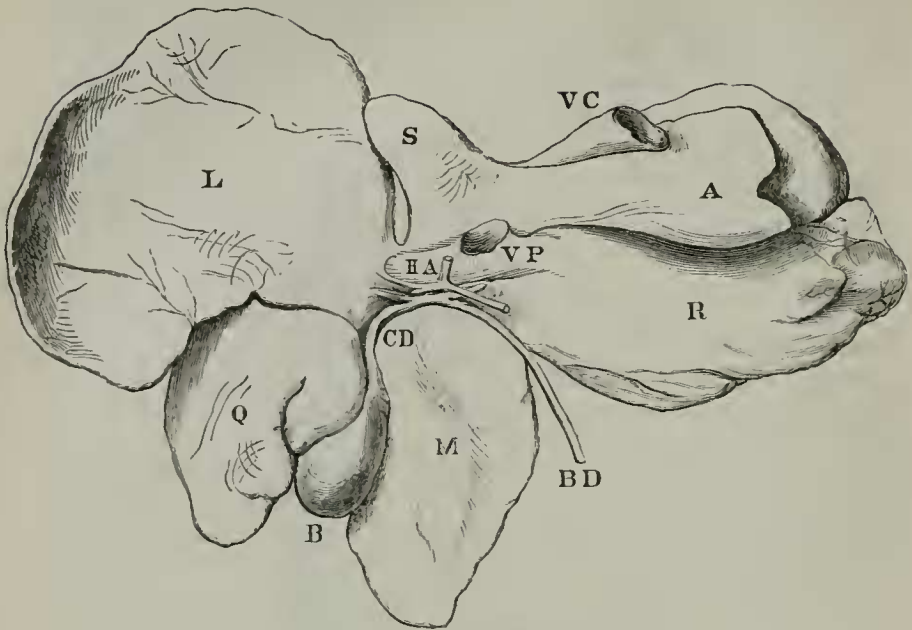
Fig. 7.



Upper surface of liver; half the natural size.

R. Right lobe. *L.* Left lobe. *M.* and *Q.* Divisions of the middle lobe. *S.* Spigelian lobe turned upwards. *B.* Gall-bladder. *U.* Remains of umbilical vein. *VC.* Vena cava. *HV.* Orifices of hepatic veins.

Fig. 8.



Under surface of liver; half the natural size.

R. Right lobe. L. Left lobe. M. and Q. Divisions of the middle lobe. S. Spigelian lobe. A. Accessory (caudate) right lobe. B. Gall-bladder. CD. Cystic duct. BD. Common bile-duct. HA. Hepatic artery. VC. Vena cava. VP. Vena porta.

doubling on itself at the neck as figured by Daubenton in the Hyæna. Its length is 1''·7, its greatest diameter ·8''. It passes gradually into the nearly straight cystic duct, which is ·7'' long. The hepatic duct is formed of two branches, one from the left and middle lobe, and one from the right lobe; just before they unite, the cystic duct joins the former. The common bile-duct is 2'' long, and enters the duodenum about 2'' below the pylorus, after running very obliquely through the intestinal walls, and being joined by the pancreatic duct.

The pancreas is very long and slender, 9'' in length.

The spleen is long, narrow, and flat. It has an oblique fissure on its outer surface near the upper end, and a slight longitudinal fissure near the middle of the same surface. The lower extremity is rather narrower than the upper. Its length is 7 $\frac{3}{4}$ '', its greatest diameter 1''.

The right kidney was placed nearly an inch higher than the left. These organs are simple and of the usual form; 2''·4 long, and 1''·4 broad. The superficial veins have the same arborescent arrangement as in the Hyænas and *Felidæ*.

The suprarenal bodies were placed close to the inner side of the upper end of the kidney. They have a flattened rhomboid form, and are larger at the upper end. The length of each is ·9''; its width at the upper end ·5'', at the lower end ·35''.

ORGANS OF GENERATION.

The penis is large and cylindrical, supported for rather more than half its length along the hinder part of the underside of the abdomen by a rather lax fold of skin. The terminal part (nearly 2 inches in length) is free and pendulous, and covered with a prepuce having a thin, delicate, and nearly white hairless integument. The entire length of the penis in its relaxed state is rather more than 4 inches; its diameter nearly uniform throughout, $\cdot 6''$. The glans (fig. 9) is a flattened cone, without distinct corona. The upper surface is obliquely

Fig. 9.



Dorsal surface of glans penis; natural size.

m. Meatus urinarius.

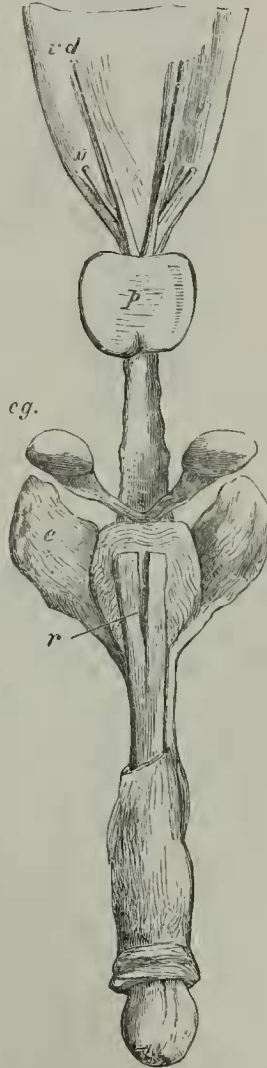
bevelled towards the apex, and presents a median slit, bordered by a pair of puckered, soft, dark-red lips. When these are separated (as in fig. 9), a conical body of cartilaginous hardness is disclosed. The rounded apex and dorsal ridge of this are white, smooth, and shining; the sides are pink, and beset with very minute white horny tubercles. Immediately under the apex of this body, which projects directly forwards, is the orifice of the urethra (*m.*), wide enough to admit a large probe. The outer surface of the glans is covered with very minute recurved spines, except near the margins of the median dorsal fissure. There is an indistinct raphe below, but no frænum. The skin covering the under surface of the hinder part of the penis, immediately in front of the scrotum, is raised somewhat, for a space of $1''$ in length and $\cdot 7''$ in width, by a pair of oblong clusters of yellowish sebaceous glands, placed close to the middle line, but with a narrow non-glandular interval between them.

The scrotum is nearly naked. It forms a very slight prominence; but the outline of the two testes can just be distinguished through the skin. These are in contact posteriorly, but separated in front. Each is somewhat pyriform, with the smaller end forwards, $1''$ long and $\cdot 6''$ in greatest diameter, with a rather small subglobular epididymis attached to the larger or posterior extremity.

Between the scrotum and the tail is a considerable eminence, occasioned chiefly by the immense anal glands. Upon this is a large T-shaped aperture; the upper transverse part, $1\frac{1}{4}$ " in width, leads to a great follicle rather more than an inch deep. Within the lips of the lower, longitudinal part of the opening is placed the anus.

The prostate (fig. 10, *p*) is large and flat, projecting very considerably on each side of the urethra, concave from side to side on its under or rectal surface, and with both anterior and posterior margins, though especially the former, notched; so that the whole gland

Fig. 10.



Organs of generation, inferior surface; half the natural size.

u. Ureter. *vd*. Vas deferens. *p*. Prostate. *cg*. Cowper's gland. *e*. Erector penis muscle. *r*. Retractor penis muscle.

has the appearance of a broad bilobed disk. Its length in the middle line is $\cdot 8''$, its greatest breadth $\cdot 1''$, greatest thickness $\cdot 2''$.

The vasa deferentia (*vd*) enter the upper part of the prostate without any manifest dilatation or trace of vesiculæ seminales.

The floor of the prostatic portion of the urethra is raised in the middle line into a distinct narrow ridge, which enlarges into a rounded prominence $\cdot 6''$ below the neck of the bladder, and again immediately contracts, and after $\frac{1}{4}$ inch entirely subsides. On each side of the prominence is a tolerably deep depression. There is no distinct median *cul de sac*, or *uterus masculinus*; and the vasa deferentia appear to empty themselves on the anterior surface of the before-mentioned eminence, as a minute orifice could be seen there, though too fine to admit a bristle.

The membranous portion of the urethra is $1''\cdot 8$ in length and capacious. Its lining membrane is thrown into longitudinal folds. Near its anterior termination the ducts of Cowper's glands enter. These bodies are oval, with compressed sides meeting at an angle at one border, the other border being broad and rounded. The length of each is $\cdot 6''$, its greatest width $\cdot 4''$; the duct is $\cdot 7''$ long.

The bulb is very prominent, with a thick muscular covering. The erector penis is large; and there is a pair of strong retractors on the underside of the organ. As far as can be ascertained by external examination, the penis agrees with that of the *Hyæna* in possessing no bone, though this structure, so conspicuous in most of the *Carnivora*, is represented by the hard central terminal portion of the glans before mentioned. Not wishing to injure this unique specimen, I have not made a section through this.

The generative organs of a male striped *Hyæna* are described by Daubenton. As far as can be made out from his account and the figure which accompanies it, they are an almost exact counterpart to those of *Proteles*.

In a specimen of the same parts of *Hyæna crocuta*, in the College-of-Surgeons Museum, the glans is very like that of *Proteles*; but the lips of the upper slit are less conspicuous and do not appear to meet over the hard apex, which also is much less prominent. The chief difference, however, is in the prostate, which, though of the same general form, is greatly reduced in size, being but half an inch in length, and rather less in breadth.

ANAL GLANDS.

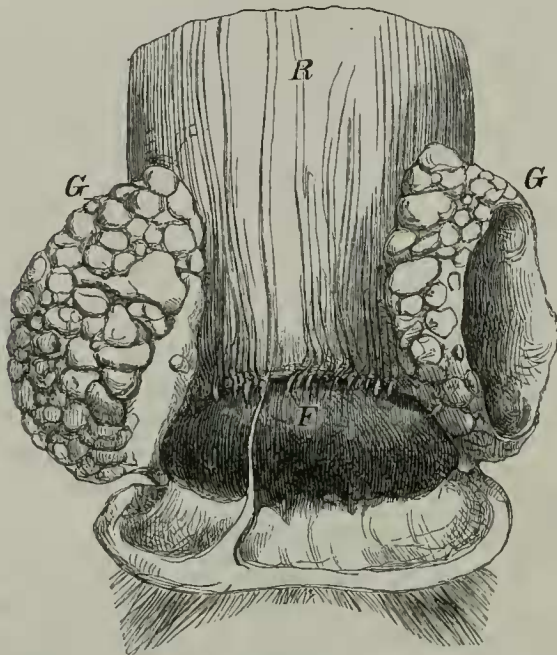
As before mentioned, immediately above the anus, and, in fact, having a common external aperture with the termination of the intestine, is a wide transverse follicle, or pouch, lined by a soft thin membrane of a greenish colour, studded over with minute orifices, each in the centre of a small papilla. This sac is $1\frac{1}{2}''$ in width, and $1''$ in depth; on each side, rather more than $\frac{1}{2}''$ within the cutaneous margin, is an aperture large enough to admit an ordinary-sized probe.

The walls of the saccular depression are glandular, $\cdot 2''$ thick, and of a very dark olive-green colour. Some of the longitudinal bands

of muscular fibres from the rectum pass over this sac and are inserted into the skin above it. Circular fibres pass around it, enclosing the follicle and anus in a common sphincter.

On making a section through the thick wall of this sac, it is seen to be composed of a number of pyramidal dark-coloured glandular bodies, with the broad ends at the outer surface, and their apices towards the inner wall of the follicle, and separated from each other by a thin layer of areolar tissue. Within the apical portion of each gland is an oval cavity containing a yellowish cheesy substance. Each of these little reservoirs communicates with the large sac by one of the minute round orifices previously noticed.

Fig. 11.



Termination of rectum and anal glands, from above; natural size.

R. Superior surface of rectum. *F.* Supraanal follicle. *G.* Lateral glandular sacs.

On each side of this median supraanal gland, and lying on the outer and upper surface of the rectum, is a conspicuous body (fig. 11, *G*) of a somewhat oval shape, 1·6'' in length, and 1'' wide at its thickest part. When cleaned from the investing lax cellular tissue and a not very distinct layer of muscular fibres, it is seen to be smaller at the upper and anterior end, broad at the posterior end (where it comes into contact with the skin), convex externally, and flattened or slightly concave on the surface which lies against the outer wall of the rectum. It is attached only by a very short pedicle ·2'' wide, which connects it with the lateral part of the supra-